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PATENT
Docket No.: 016494-001100US

On August 29, 2003

TOWNSEND and TOWNSEND and CREW LLP

By: James Currier Carr

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of:

Robert E. Gillis

Application No.: 09/919,748

Filed: July 31, 2002

For: EMERGENCY SHELTER
STRUCTURE

Examiner: Winnie S. Yip

Art Unit: 3637

APPELLANT'S BRIEF
UNDER 37 CFR §1.192

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Further to the Notice of Appeal filed with the Patent Office with a receipt date of June 30, 2003, Applicant submits Appellant's Brief under 37 C.F.R. 1.192. This Brief is submitted in triplicate.

The Commissioner is hereby authorized to charge Applicant's Deposit Account No. 20-1430 for any additional extension or other fees required as well as for the Appeal Brief fee of \$160. Please apply any other charges or credits to Deposit Account No. 20-1430.

REAL PARTY IN INTEREST

The real party in interest is the inventor Robert E. Gillis.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-20 are pending in the application. Claims 1-20 presently stand rejected and are the subject of this appeal. Claims 1-20 as presently constituted are set forth in Appendix A hereto.

STATUS OF AMENDMENTS

Applicant filed an Amendment After Final on May 29, 2003 with respect to claims 5-7, 12-14, and 16-17 seeking to overcome certain §112 rejections of the Examiner set out in the Office Action dated January 29, 2003 and to place the claims in better form for allowance or appeal. A copy of the January 29, 2003 Office Action is attached as Appendix B. A copy of applicant's Amendment After Final is attached as Appendix C. In an Advisory Action mailed June 6, 2003, Examiner Winnie S. Yip entered the amendments but continued to reject all of pending claims 1-20. A copy of the Examiner's Advisory Action is attached as Appendix D. The basis for the continued rejection of the claims was not specified in the Advisory Action.

SUMMARY OF THE INVENTION

The invention relates to a flexible shelter structure, such as a tent, which is particularly suitable for emergency use in the event of environmental disasters, to accommodate displaced victims. The inventive structure is designed to be able to withstand extreme and varying weather conditions, over long periods of time if need be, and to be easily manufacturable using commonly available materials at relatively low cost.

In the preferred embodiment described in the specification, the inventive structure comprises a plurality of flexible, resilient, elongated poles 20 arranged to intersect each other and forming a plurality of pole crossing points 25. Each of the poles has first and second ends 20a, 20b and assumes a substantially arcuate shape under

tension to form a substantially dome-shaped frame having an interior volume 35. The first and second ends terminate in a common plane, such as the ground 40, 42, 44, 46. Fig. 1; p. 2, lines 7-17; p. 3, lines 1-16. The poles are arranged relative to each other to form one or more four-sided openings 50, 51, 52, 53, such opening(s) defined by pole crossing points as vertices and sections of poles as sides. Figs. 2-3; p. 2, lines 7-17; p. 3, lines 23-34. One or more tension harnesses are connected between diagonal vertices of one or more openings, thereby providing an exceptionally rigid and strong frame. Figs. 2-3; p. 2, lines 7-17; p. 4, lines 1-25. A covering is connected to the frame to substantially shelter an interior volume defined by the frame. Figs. 4-5; p. 2, lines 7-17; p. 4, line 33 - p. 5, line 16.

ISSUES

The issues on appeal are:

- (1) Whether the Examiner's rejection of claims 5-7, 12-14, and 16-17 for indefiniteness under 35 U.S.C. §112, second paragraph is in error.
- (2) Whether the Examiner's rejection of claims 1-20 as being unpatentable for obviousness under 35 U.S.C. §103(a) over Warner et al. U.S. Patent No. 4,106,520 ("the Warner et al. '520 Patent) in view of Cannon et al. U.S. Patent No. 4,677,999 ("the Cannon et al. '999 Patent) is in error.

GROUPING OF THE CLAIMS

Other than as expressly stated here, the claims do not stand or fall together.

Claims 1, 2-4, 8, 11, and 18 stand or fall together.

Claims 6-7, 12-15 stand or fall together.

Claims 9-10 stand or fall together.

Claims 16-17 stand or fall together.

Claims 19-20 stand or fall together.

ARGUMENT

A. The Examiner's Claim Rejections

In the Office Action of January 29, 2003 (Appendix B), the Examiner rejected claims 5-7, 12-14, and 16-17 as unpatentable under §112, second par. for indefiniteness. The Examiner also rejected all pending claims 1-20 as unpatentable for obviousness under 35 U.S.C. §103(a) over the Warner '520 Patent in view of the Cannon et al. '999 Patent. A copy of Warner et al. '520 is attached as Appendix E. A copy of Cannon et al. '999 is attached as Appendix F.

With respect to the indefiniteness rejection of claims 5-7 and 12-14, the Examiner contended it is unclear whether the "tension harness" recited in the rejected claims is the same tension harness or a different tension harness than the one recited in independent claim 1, from which the rejected claims depend. With respect to the indefiniteness rejection of claims 16-17, the Examiner contended that phrases "at least one tension harness" and "each tension harness" recited in the rejected claims are unclear because only "tension harness" is previously recited in independent claim 1 from which the rejected claims depend.

Subsequently, on May 29, 2003, applicant filed his Amendment After Final (Appendix C), in which he further amended claims 5-7, 12-14, and 16-17 to overcome the Examiner's indefiniteness rejection. As noted previously, the Examiner entered those amendments in an Advisory Action dated June 6, 2003 (Appendix D) but continued her rejection of claims 1-20.

With respect to the obviousness rejection of claims 1-20, the Examiner contended that Warner et al. '520 teaches a frame for a shelter structure comprising a "plurality of flexible poles," with "the poles being assumed a substantially arcuate shape under tension," and the "poles being intersected to form a plurality of crossings and a plurality of four-sided opening having vertices formed by crossings of poles and sides formed by sections of poles" The Examiner conceded that "Warner et al. do not define the shelter structure having at least one of the tension harness extending across the

opening and connecting the non-adjacent pair of diagonal vertices of the opening as claimed.” Appendix B, p. 3.

However, the Examiner contended that “Cannon et al. teaches a shelter structure having a plurality of poles being connected together to define a plurality of crossings (T1, T2) and a plurality of four-sided openings adjacent each other, a plurality of tension harnesses (10) extending across the opening and connecting each non-adjacent pair of diagonal vertices (i.e., P9, P11) for providing stronger support” Appendix B, p. 3.

The Examiner did not provide any reasoning why a person skilled in the art would have been led to combine the teachings of Warner et al. ‘520 and Cannon et al. ‘999 as the Examiner did.

The Examiner further contended that with regard to claims 5-7 and 12-15 “it is common engineering practice to provide suitable numbers of tensions harnesses extending across and connecting suitable non-adjacent pairs of vertices of openings in various arrangements as claimed as an obvious matter of design choice” Appendix B, p. 3-4. The Examiner did not cite any reference of record or any other support for this contention.

Applicant believes that although the June 6, 2003 Advisory Action did not specify the reasons for the continued rejection of claims 1-20, applicant’s amendments to claims 5-7, 12-14, and 16-17 submitted in Applicant’s Amendment After Final addressed and overcame the Examiner’s rejection of those claims under §112, second paragraph. Applicant therefore believes the Examiner's continued rejection of claims 1-20 was solely based on the prior art. However, since applicant cannot be certain of this, applicant appeals the Examiner’s rejection of the claims under §112, second paragraph.

Applicant further contends the Examiner misread and/or misunderstood the teachings of Warner et al. ‘520 and Cannon et al. ‘999, and that the references as properly read and understood do not teach what the Examiner contends they do. Applicant further contends the Examiner improperly combined the references and that persons skilled in the art would not have been led to make the combination made by the

Examiner to reject the claims. Finally, Applicant contends neither Warner et al. '520, nor Cannon et al. '999, nor the combination of the two disclose or suggest the invention as claimed in pending claims 1-20.

B. Warner '520 Does Not Teach What The Examiner Contends

The Examiner contends that "the poles being assumed a substantially arcuate shape under tension ... to define a dome-shaded interior volume" This is an incorrect reading of the Warner et al. reference. Warner et al. describes that "the frame comprises a plurality of substantially semi circular arched support ribs pivoted together on a common locus" Col. 1, lines 30-32. The frame is "extremely resistant to wind and snow loading due to *the hoops following a predetermined curve*" Col. 1, lines 56-58 (emphasis added). Further, "at least two sets of arched support ribs are provided and each set of hoops comprises a plurality of semi circular or curved ribs 10 pivoted on a common locus by the ends thereof as indicated by reference character 11 *so that they can be collapsed one upon the other for transportation and storage The support ribs can be formed from solid or tubular stock as desired.*" Col. 2, lines 25-33 (emphasis added).

Nowhere does Warner et al. teach that the "support ribs" that make up the frame are made of a flexible or resilient material. Nor does Warner et al. teach that the "support ribs" assume a substantially arcuate shape under tension. To the contrary, Warner et al. teaches that the tubes used to make the frame are a "solid or tubular stock," and that they are pre-shaped in a "predetermined curve" shape. As a result, they stay in that shape, even when collapsed upon each other, for easier transportation and storage. Since Warner et al.'s "support ribs" are not flexible or resilient, and are not tensioned into a substantially arcuate shape, there is no need or reason to use a tensioning mechanism, such as a tension harness, to help maintain them in that shape.

C. Cannon '999 Does Not Teach What the Examiner Contends

The Examiner contends that "Cannon et al. teaches a shelter structure having a plurality of poles connected together to define a plurality of crossings (T1, T2)

and a plurality of four-sided openings adjacent each other" This is not a correct reading of the Cannon et al. reference. Cannon et al. teach a shelter structure having a plurality of poles P1-P14, which stand straight up vertically and which do not cross at all. This is seen from the top in Fig. 2, and from the side in Figs. 3 and 4. It is also described at Col. 3, lines 37-46 where P1-P14 are described as "fourteen posts." Further, T1 and T2 are not crossing points. They are tie down locations where there are no vertical posts and instead vertical tie down lines 5 are used. This is shown in Fig. 2 from the top and in Fig. 5 from the side. At Col. 4, lines 1-7, the specification states: "At the intermediate points T1 and T2 it is not necessary to provide a post but desirable to provide tie-down wires 5 (FIG. 5) from the tension point to an anchor block 6 buried in the ground."

Cannon et al. does not teach to form a frame out of crossed poles, and therefore does not teach a frame in which such poles define any four-sided openings having pole segments as sides or pole crossings as vertices.

The Examiner contends that Cannon et al. teach a shelter structure having "a plurality of tension harnesses (10) extending across the opening and connecting each non-adjacent pair of diagonal vertices (i.e., P9, P11) for providing stronger support to a flexible membrane (13) supported thereon" The Examiner's reading of the Cannon et al. reference is incorrect in this regard. First, as described previously, Cannon et al. does not describe a structure having any pole crossings, and certainly not one with pole crossings defining vertices of openings. The references P9 and P11 are not to pole crossing points, but to the tops of upright, standing poles. Second, the reference 10 is to a plurality of guy wires that extend between the tops of upright poles P1-P14. This is seen in Fig. 2 and described at Col. 3, lines 54-56. Since Cannon et al.'s structure has no pole crossings, there can be no non-adjacent diagonal vertices corresponding to pole crossings, as claimed, and the guy wires do not extend between any such non-adjacent diagonal vertices.

There is also no teaching in Cannon et al. that the guy wires 10 provide stronger support to a flexible membrane. To the contrary, the totality of the teaching concerning the guy wires 10 is found at Col. 3, lines 54-56 and states: "The posts are

further located by diagonal guy wires 10, which also serve to locate the centre posts P13 and P14." In other words, the guy wires simply maintain the location of the posts relative to each other. There is nothing to indicate that the guy wires 10 are intended to or impart any strength to a flexible membrane. Indeed, the only teaching in Warner concerning any portion of the structure imparting such strength to the membrane is with respect to the vertical tie-downs T1 and T2. At Col. 4, lines 5-7, the specification teaches that "The tie-down wires 5 serve to restrain the canopy in windy situations and prevent upward bowing or ballooning."

Applicant believes that in reading the Cannon et al. reference, the Examiner erroneously misconstrued the double crossing lines shown in Fig. 2 to be crossing poles. In fact, although not specifically identified in Fig. 2, it is clear from the specification that the lines represent "tendons" that are sewn into the edges of the cloth panels that are sewed together to make up the canopy cover that sits atop the poles, and not the poles themselves.

D. The Examiner Erred in Combining the Teachings of Warner et al. '520 and Cannon et al. '999

In order for the Examiner to combine the teachings of Warner et al. '520 and Cannon et al. '999, the Examiner must point to evidence showing a suggestion, reason, or motivation to make the combination. In re Laskowski, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397 (Fed. Cir. 1989); In re Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984). The Examiner has not done so. It is pure hindsight, and legally erroneous, for the Examiner to combine elements of the references simply to reconstruct the claimed invention. Id. However, that is what the Examiner did in this instance. Indeed, in this instance, not only is there no adequate suggestion to combine the teachings of the references, the references actually teach away from the combination the Examiner made.

Warner et al. '520 teaches to use "support ribs" of a "solid or tubular stock" material which is preformed into a "predetermined curve" shape. To facilitate construction and deconstruction of the frame, the ends of the support ribs are pivoted on a common locus. Thus, construction involves simply radially spreading out the preformed

curved ribs and deconstruction involves simply rotating them back together again. Warner et al. do not teach that the ribs are under any tension whatsoever, let alone that any tension is what causes them to assume or maintain their shape. To the contrary, Warner et al. teach they are preformed in a curved shape. Because assuming and maintaining the shape of the ribs does not depend upon applying or maintaining any tension on the ribs, persons skilled in the art would clearly understand that there would be no need and no reason to provide tension harnesses. For that reason, persons skilled in the art would not be led to combine the guy wires of Cannon et al. '999 with the structure taught by Warner et al. '520.

Additionally, the guy wires 10 of Cannon et al. '999, when properly understood, are not tension devices, and certainly not the tension harnesses recited in the presently rejected claims. Cannon et al. teach a structure having a plurality of upright poles P1-P14. A canopy is connected atop the poles. Cannon et al.'s poles do not cross each other, are not bent in any shape, and are not bent in any shape under tension. Cannon et al. teach to use guy wires 10 between the poles to "locate" them relative to each other, in other words to make sure they are spaced properly to support the canopy. Cannon et al. do not teach that the guy wires tension the poles in any way, and certainly not by providing tension between non-adjacent vertices of four-sided openings formed by pole crossings and pole sections, as recited in the rejected claims. Accordingly, even if a person skilled in the art were looking for a tensioning mechanism for the structure taught by Warner et al., the person would not be led to employ the guy wires of Cannon et al. because they are used in a completely different type of structure, for a completely different purpose.

Neither Warner et al. nor Cannon et al. provide any teaching or suggestion to make the combination made by the Examiner. The only possible basis for the combination was an attempt to reconstruct the claimed invention, based on the teaching of the application itself. Such hindsight reconstruction is erroneous and the rejection of claims 1-20 should therefore be overturned.

E. Warner et al. '520 and Cannon et al. '999 Do Not Disclose or Suggest the Presently Claimed Invention

1. Independent Claim 1, Dependent Claims 2-4, 8, 11, 18

Claim 1 is the only independent claim presently pending. It recites a frame for a shelter structure having a plurality of intersecting poles defining a plurality of pole crossings and at least one four-sided opening. The opening is defined by two-non-adjacent pairs of vertices defined by pole crossings, and the sides are defined by sections of the crossing poles. Each of the poles assumes a substantially arcuate shape under tension. A tension harness extends substantially diagonally across the opening and directly connects a pair of non-adjacent vertices of the opening.

Claim 2 depends from claim 1 and recites a shelter structure comprising the frame of claim 1 and a connected membrane.

Claim 3 depends from claim 1 and recites that the poles are arranged to form a plurality of four-sided openings.

Claim 4 depends from claim 1 and recites that the poles are arranged to define an interior volume that is substantially dome-shaped.

Claim 8 depends from claim 1 and recites that the poles are substantially flexible and resilient.

Claim 11 recites that a plurality of four-sided openings are formed and at least some of them are adjacent each other.

Claim 18 depends from claim 1 and recites that the tension harness is constructed of a low-stretch material.

Warner et al. '520 does not disclose or suggest a structure in which crossing poles assume a substantially arcuate shape under tension, particularly one with poles that are substantially flexible and resilient. In fact, Warner et al. does not disclose or suggest that the "support ribs" of the structure are under tension at all. To the contrary, the support ribs are preformed in a curved shape from solid or tubular stock.

Cannon et al. '999 does not disclose or suggest a structure with any crossed poles, and no openings formed by sections of crossed poles and vertices at pole

crossing point. Nor does Cannon et al. disclose or suggest any kind of tension device between said pole crossing vertices. The guy wires of Cannon et al. are not tension harness or, indeed, any type of tensioning device. As described by Cannon et al., the guy wires are "locating" devices, for determining the proper spacing between the multiple upright poles upon which Cannon et al.'s canopy is supported.

The Examiner's combination of Warner et al. and Cannon et al. without any suggestion or reason to combine them other than an attempt to reconstruct the claimed invention is erroneous hindsight. Further, even if the Examiner were able to combine the references, as demonstrated the combination does not disclose or suggest all of the limitations of the invention as recited in claim 1, and therefore cannot render it obvious.

Since claims 2-4, 8, 11, and 18 depend from claim 1, they are patentable over the prior art of record for at least the same reasons as claim 1. In addition, each of the other pending claims depend from claim 1 directly or indirectly, and therefore each of these claims is patentable for at least the same reasons as claim 1.

2. Dependent Claim 5

In addition to the fact that claim 5 depends from claim 1 and is therefore patentable over the prior art of record for that reason, claim 5 further recites that the tension harness connects each pair of non-adjacent vertices of the at least one opening.

This claim is believed separately patentable because nothing in the previous claims suggests to have a tension harness connect each of two pair of non-adjacent vertices in a structure as recited in claim 1. Further, neither Warner et al. '520, nor Cannon et al. '999 suggests this additional tensioning structure in order to provide even further support and stiffness to the frame.

3. Dependent Claims 6-7, 12-15

Each of claims 6-7 and 12-15 ultimately depend from claim 1 and are therefore patentable over the prior art of record for at least the same reasons as claim 1. In addition, these claims are believed to be separately patentable because they each recite

the tension harness connecting non-adjacent pairs of vertices of a plurality of openings of the frame. Claims 6 and 7 recite connecting non-adjacent pairs of vertices of a plurality of openings. Claim 12 recites that the tension harness connects non-adjacent pairs of vertices of at least a pair of adjacent openings. Claims 13-15 recite that the tension harness connects non-adjacent pairs of vertices of a plurality of pairs of adjacent openings, all adjacent openings, and all diagonally adjacent openings, respectively.

The Examiner's gratuitous statement that "it is common engineering practice to provide suitable numbers of tension harnesses extending across and connecting suitable non-adjacent pairs of vertices of openings ... for providing a frame with suitable tensioning support" has no support whatsoever in the record, and cannot form a basis for rejecting these claims. Neither Warner et al. '520 nor Cannon et al. '999 discloses or suggests such an arrangement of a tension harness between multiple pairs of non-adjacent vertices of multiple openings in a structure of the type claimed.

4. Dependent Claims 9-10

In addition to being patentable over the prior art of record for at least the same reasons as claim 1, claims 9 and 10 are believed to be separately patentable. Claim 9 recites that in addition to the tension harness connecting non-adjacent pairs of vertices, at least some pairs of intersecting poles are also connected together near their points of intersection. As described in the specification, this additional measure can provide even additional stiffness and support to the frame. Claim 10 recites that each pair of intersecting poles is connected together near the point of intersection. The tension harness recited in the previous claims does not itself suggest this additional connection of the poles.

Neither Warner et al. '520 nor Cannon et al. '999 discloses or suggests to connect together intersecting poles near their points of intersection in combination with connecting non-adjacent vertices with a tension harness.

5. Dependent Claims 16-17

In addition to being patentable over the prior art of record for at least the same reasons as claim 1, claims 16 and 17 are believed to be separately patentable. The claims recite having either “a” or “the” free ends of the tension harness fastened to the common plane. As described in the specification, the common plane is typically the ground. Nothing in the previous claims suggests to fasten one or more free ends of the tension harness to the ground or another common plane.

Neither Warner et al. nor Cannon et al. disclose or suggest fastening the free ends of a tension harness to the common plane in a crossed-pole structure as recited.

6. Dependent Claims 19-20

In addition to being patentable over the prior art of record for at least the same reasons as claim 1, claims 19 and 20 are believed to be separately patentable. The claims recite the tension harness being either integrally formed with the membrane that provides the sheltered space (claim 19), or being connected to the membrane at a plurality of points (claim 20). Nothing in the previous claims suggests such a relationship between the tension harness and the membrane.

Neither Warner et al. nor Cannon et al. disclose or suggest forming a tension harness integrally with a membrane or connecting it to a membrane. Indeed, in the January 29, 2003 Office Action (Appendix B) rejecting the claims, the Examiner did not even contend that Warner et al. or Cannon et al. disclosed such a feature.

F. Applicant's Amendments To Claims 5-7, 12-14, and 16-17 Cured The Examiner's Indefiniteness Problems

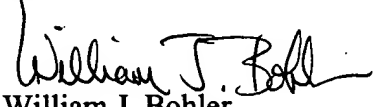
The Examiner rejected claims 5-7 and 12-14 on the basis it was unclear whether the “tension harness” recited in those claims was the same “tension harness” recited in claim 1, from which the claims depend, or another tension harness. Applicant amended each of the claims to replace “tension harness” with “said tension harness,” thereby clarifying that the tension harness was the same tension harness previously recited in claim 1. Those amendments cured the Examiner's indefiniteness problems.

The Examiner rejected claims 16-17 on the basis that the "at least one tension harness" recited in claim 16, and the "each tension harness" recited in claim 17 are not consistent with "a tension harness" recited previously in claim 1, from which both claims depend. Applicant amended claims 16 and 17 to replace "each tension harness" and "at least one tension harness" with "said tension harness," thereby making the recitations in claims 16 and 17 consistent with the "a tension harness" recitation of claim 1. Those amendments cured the Examiner's indefiniteness problems.

CONCLUSION:

For all of the foregoing reasons, Applicant respectfully submits the final rejection of pending claims 5-7, 12-14, and 16-17 for indefiniteness under 35 U.S.C. §112, second par., and the final rejection of claims 1-20 as unpatentable for obviousness under 35 U.S.C. 103(a) over Warner et al. '520 and Cannon et al. '999 are erroneous and should be reversed.

Respectfully submitted,


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Attachments: Appendix A - Claims on Appeal
Appendix B - Office Action mailed January 29, 2003
Appendix C - Applicant's Amendment After Final mailed May 29, 2003
Appendix D - Advisory Action mailed June 6, 2003
Appendix E - Warner et al. U.S. Patent No. 4,106,520
Appendix F - Cannon et al. U.S. Patent No. 4,677,999

WJB/djb/acc
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APPENDIX A

1. A frame for a shelter structure, comprising:
a plurality of poles arranged in intersecting relationship with a plurality of pole crossings such that at least one four sided opening is formed having pole crossings defining two non-adjacent pairs of vertices and having sections of said poles defining sides thereof;
each of said poles having a first terminal end and a second terminal end;
each of said poles assuming a substantially arcuate shape under tension with said first and second terminal ends of each pole terminating in a common plane to thereby define an interior volume; and
a tension harness extending substantially diagonally across said opening and directly connecting a non-adjacent pair of vertices of said opening.
2. A shelter structure comprising the frame of claim 1 and a membrane connected to at least some of said poles to substantially shelter said interior volume.
3. The frame of claim 1 wherein said poles are arranged to form a plurality of said four-sided openings.
4. The frame of claim 1 wherein said poles are arranged to define an interior volume that is substantially dome shaped.
5. The frame of claim 1 wherein said tension harness directly connects each pair of non-adjacent vertices.
6. The frame of claim 3 wherein said tension harness extends substantially diagonally across and directly connects a non-adjacent pair of vertices of each of a plurality of said openings.

7. The frame of claim 3 wherein said tension harness extends substantially diagonally across and directly connects each pair of non-adjacent vertices of each of a plurality of said openings.

8. The frame of claim 1 wherein said poles are substantially flexible and resilient.

9. The frame of claim 1 wherein at least some pairs of intersecting poles are connected together near at least some of said pole crossings.

10. The frame of claim 1 wherein each pair of intersecting poles is connected together near each of the pole crossings.

11. The frame of claim 1 wherein a plurality of four-sided openings are formed, at least some of which are adjacent each other.

12. The frame of claim 11 wherein said tension harness connects between a non-adjacent pair of vertices of at least one pair of adjacent openings.

13. The frame of claim 11 wherein said tension harness connects between a non-adjacent pair of vertices of a plurality of pairs of adjacent openings.

14. The frame of claim 11 wherein said tension harness connects between a non-adjacent pair of vertices of all adjacent openings.

15. The frame of claim 11 having a tension harness connected between a non-adjacent pair of vertices of all diagonally adjacent openings.

16. The frame of claim 1 having a free end of said tension harness fastened to the common plane.

17. The frame of claim 1 having the free ends of said tension harness fastened to the common plane.

18. The frame of claim 1 wherein said tension harness is constructed of low stretch material.

19. The shelter structure of claim 2 wherein said tension harness is integrally formed with said membrane.

20. The shelter structure of claim 2 wherein said tension harness is connected to said membrane at a plurality of points.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/919,748	07/31/2001	Robert E. Gillis	016494-001100US	5719

20350 7590 01/29/2003

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EXAMINER

YIP, WINNIE S

ART UNIT PAPER NUMBER

3637

DATE MAILED: 01/29/2003

Amend/Appeal Due 4/29/03 SZ

Please find below and/or attached an Office communication concerning this application or proceeding.

5

Office Action Summary	Application No.	Applicant(s)	
	09/919,748	GILLIS, ROBERT E.	
	Examiner	Art Unit	
	Winnie Yip	3637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

Part II DETAILED ACTION

This office action is in response to applicant's amendment filed on July 23, 2000.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

1. Claims 5-7, 12-14, and 16-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regard to claims 5-7 and 12-14, the recited limitation feature "a tension harness" is confusing whether this "tension hardness" of claims 5-7 and 12-14 is a different tension harness than of one in claim 1. If so, applicant needs to differentiate them such as by "first tension harness" and "second tension hardness". If they are the same, they must be defined with proper antecedent basis or same terminology.

In regard to claims 16-17, the recited limitation features "at least one tension harness" (claim 16) and "each tension harness" (claim 17) do not appear to consist with the limitation of the body of the claim because there is only "a tension harness" being previously defined in claim 1.

Claim Rejections - 35 USC § 103

2. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warner et al. (US Patent No. 4,106,520) in view of Cannon et al. (US Patent NO. 4,677,999).

Warner et al. show and disclose a frame for a shelter structure, comprising a plurality of flexible poles (10) each having two terminal ends, the poles being assumed a substantially actuate shape under tension with the two terminal ends (11) being terminated into a common plane such as to the ground to define a dome-shaded interior volume, the poles (10) being intersected to form a plurality of crossings (13) and a plurality of four-sided openings adjacent each other, each of the four-sided opening having vertices formed by crossings of poles and sides formed by sections of poles, and a flexible membrane being supported by the poles at a plurality of points. Warner et al. do not define the shelter structure having at least one of the tension harness extending across the opening and connecting the non-adjacent pair of diagonal vertices of the opening as claimed. Cannon et al. teaches a shelter structure having a plurality of poles being connected together to define a plurality of crossings (T1, T2) and a plurality of four-sided openings adjacent each other, a plurality of tension harnesses (10) extending across the opening and connecting each non-adjacent pair of diagonal vertices (i.e., P9, P11) for providing stronger support to a flexible membrane (13) supported thereon, and at least one tension harness (7) having a free end fastened to a common plane such as ground. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the shelter structure of Warner et al. having suitable tension harnesses extending across the openings of the poles and directly connecting the non-adjacent diagonal vertices of the openings as taught by Cannon et al. for providing the shelter frame with a strongly support to the flexible membrane at the locations of openings.

In regard to claims 5-7 and 12-15, it is common engineering practice to provide suitable numbers of tensions harnesses extending across and connecting suitable non-adjacent pairs of

Art Unit: 3637

vertices of openings in various arrangement as claimed as an obvious matter of design choice for providing a frame with suitable tensioning support for various applications.

Response to Amendment

3. Applicant's arguments filed October 28, 2002 with respect to claims 1-20 under U.S.C. 102/103, and specifically to the feature for "directly connecting a non-adjacent pair of vertices of opening" has been considered. This feature was not specifically and previously claimed in claims. Therefore, this argument is deemed to be moot in view of the new grounds of rejection.

ACTION IS FINAL

4. Applicant's amendment necessitated the new grounds of rejection. Accordingly, THIS ACTION IS MADE FINAL. See M.P.E.P. ' 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. ' 1.136(a).

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. ' 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

Inquiry Contacts

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Winnie Yip whose telephone number is 703-308-2491. The examiner can normally be reached on M-F (9:30-6:30), Second Monday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lanna Mai can be reached on 703-308-2486. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9326 for regular communications and 703-872-9327 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

LANNA MAI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3600


wsy

January 22, 2003

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office, Fax No. 1-703-872-9327 on May 29, 2003.

**AMENDMENT UNDER 37 CFR 1.116
EXPEDITED PROCEDURE –
EXAMINING GROUP 3637**

TOWNSEND and TOWNSEND and CREW LLP

PATENT

By: _____

DJ Bogodsky

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Robert E. Gillis

Application No.: 09/919,748

Filed: July 31, 2002

For: EMERGENCY SHELTER
STRUCTURE

Examiner: Winnie S. Yip

Technology Center/Art Unit: 3637

**AMENDMENT UNDER 37 CFR 1.116
EXPEDITED PROCEDURE EXAMINING
GROUP 3637**

Mail Stop AF

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Applicant herewith amends the above-identified application after final rejection pursuant to 37 C.F.R. §1.116. The proposed amendments comply with requirements of form expressly set forth in the Office Action dated January 29, 2003, and place the claims in form for allowance or in better form for consideration on appeal.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (previously amended) A frame for a shelter structure, comprising:

a plurality of poles arranged in intersecting relationship with a plurality of pole crossings such that at least one four sided opening is formed having pole crossings defining two non-adjacent pairs of vertices and having sections of said poles defining sides thereof;

each of said poles having a first terminal end and a second terminal end;

each of said poles assuming a substantially arcuate shape under tension with said first and second terminal ends of each pole terminating in a common plane to thereby define an interior volume; and

a tension harness extending substantially diagonally across said opening and directly connecting a non-adjacent pair of vertices of said opening.

Claim 2 (original) A shelter structure comprising the frame of claim 1 and a membrane connected to at least some of said poles to substantially shelter said interior volume.

Claim 3 (original) The frame of claim 1 wherein said poles are arranged to form a plurality of said four-sided openings.

Claim 4 (previously amended) The frame of claim 1 wherein said poles are arranged to define an interior volume that is substantially dome shaped.

Claim 5 (currently amended) The frame of claim 1 ~~including a~~ wherein said tension harness directly ~~connecting~~ connects each pair of non-adjacent vertices.

Claim 6 (currently amended) The frame of claim 3 ~~including a~~ wherein said tension harness ~~extending~~ extends substantially diagonally across and directly ~~connecting~~ connects a non-adjacent pair of vertices of each of a plurality of said openings.

Claim 7 (currently amended) The frame of claim 3 ~~including a~~ wherein said tension harness ~~extending~~ extends substantially diagonally across and directly ~~connecting~~ connects each pair of non-adjacent vertices of each of a plurality of said openings.

Claim 8 (original) The frame of claim 1 wherein said poles are substantially flexible and resilient.

Claim 9 (original) The frame of claim 1 wherein at least some pairs of intersecting poles are connected together near at least some of said pole crossings.

Claim 10 (original) The frame of claim 1 wherein each pair of intersecting poles is connected together near each of the pole crossings.

Claim 11 (original) The frame of claim 1 wherein a plurality of four-sided openings are formed, at least some of which are adjacent each other.

Claim 12 (currently amended) The frame of claim 11 ~~having a~~ wherein said tension harness ~~connected~~ connects between a non-adjacent pair of vertices of at least one pair of adjacent openings.

Claim 13 (currently amended) The frame of claim 11 ~~having a~~ wherein said tension harness ~~connected~~ connects between a non-adjacent pair of vertices of a plurality of pairs of adjacent openings.

Claim 14 (currently amended) The frame of claim 11 ~~having a~~ wherein said tension harness ~~connected~~ connects between a non-adjacent pair of vertices of all adjacent openings.

Claim 15 (previously amended) The frame of claim 11 having a tension harness connected between a non-adjacent pair of vertices of all diagonally adjacent openings.

Claim 16 (currently amended) The frame of claim 1 having a free end of ~~at least one~~ said tension harness fastened to the common plane.

Claim 17 (currently amended) The frame of claim 1 having the free ends of ~~each~~ said tension harness fastened to the common plane.

Claim 18 (original) The frame of claim 1 wherein said tension harness is constructed of low stretch material.

Claim 19 (original) The shelter structure of claim 2 wherein said tension harness is integrally formed with said membrane.

Claim 20 (original) The shelter structure of claim 2 wherein said tension harness is connected to said membrane at a plurality of points.

REMARKS/ARGUMENTS

Review and reconsideration of the application are respectfully requested in view of the foregoing amendments and the following remarks.

The applicant thanks the Examiner for the telephone interview with the applicant's attorney on May 20, 2003. Discussion was had concerning the teaching of the cited Cannon et al. reference relative to the claims, as well as the §112 issues raised by the Examiner in the Office Action dated January 29, 2003.

Applicant has amended claims 5-7, 12-14, and 16-17 to address the §112 issues raised by the Examiner. Applicant believes the claims as amended overcome the §112 rejections concerning the "tension harness" noted by the Examiner in the January 29, 2003 Office Action and place the claims in form for allowance or in form for better consideration on appeal.

With respect to the substantive rejection of the claims under §103 in view of the Warner et al. and Cannon et al. references, applicant makes the following observations:

1. The Examiner states with respect to Warner et al. that "the poles being assumed a substantially arcuate shape under tension with the two terminal ends (11) being terminated into a common plane ... to define a dome-shaded interior volume" This is not a correct reading of the Warner et al. reference. Warner et al. describes that "the frame comprises a plurality of substantially semi circular arched support ribs pivoted together on a common locus" Col. 1, lines 30-32. The frame is "extremely resistant to wind and snow loading due to the hoops following a predetermined curve" Col. 1, lines 56-58. Further, "at least two sets of arched support ribs are provided and each set of hoops comprises a plurality of semi circular or curved ribs 10 pivoted on a common locus by the ends thereof as indicated by reference character 11 so that they can be collapsed one upon the other for transportation and storage The support ribs can be formed from solid or tubular stock as desired." Col. 2, lines 25-33.

In other words, the tubes used to make the frame in Warner et al. are pre-shaped in a semi circular shape and they stay in that shape, even when collapsed upon each other for transportation and storage. They are not tensioned into an arcuate shape and therefore there is no

need or reason for a tensioning mechanism, such as a tension harness, to help maintain them in that shape.

2. The Examiner states with respect to Cannon et al. that "Cannon et al. teaches a shelter structure having a plurality of poles connected together to define a plurality of crossings (T1, T2) and a plurality of four-sided openings adjacent each other" This is not a correct reading of the Cannon et al. reference. Cannon et al. teach a shelter structure having a plurality of poles P1-P14, which stand straight up vertically and which do not cross at all. This is seen from the top in Fig. 2, and from the side in Figs. 3 and 4. It is also described at Col. 3, lines 37-46 where P1-P14 are described as "fourteen posts." Further, T1 and T2 are not crossing points. They are tie down locations where there are no vertical posts and instead vertical tie down lines 5 are used. This is shown in Fig. 2 from the top and in Fig. 5 from the side. At Col. 4, lines 1-7, the specification states: "At the intermediate points T1 and T2 it is not necessary to provide a post but desirable to provide tie-down wires 5 (FIG. 5) from the tension point to an anchor block 6 buried in the ground."

Cannon et al. does not teach to form a frame out of crossed poles, and therefore does not teach a frame in which such poles define any four sided openings having pole segments as sides or pole crossings as vertices.

3. The Examiner contends that Cannon et al. teach a shelter structure having "a plurality of tension harnesses (10) extending across the opening and connecting each non-adjacent pair of diagonal vertices (i.e., P9, P11) for providing stronger support to a flexible membrane (13) supported thereon" The Examiner's reading of the Cannon et al. reference is incorrect in this regard. The reference 10 is to a plurality of guy wires that extend between the tops of poles P1-P14. Col. 3, lines 54-56. This is seen in Fig. 2. Since there are no pole crossings, there are no non-adjacent diagonal vertices corresponding to pole crossings, as claimed, and the guy wires do not extend between any such non-adjacent diagonal vertices. There is also no teaching in Cannon et al. that the guy wires 10 provide stronger support to a flexible membrane. To the contrary, the totality of the teaching concerning the guy wires 10 is found at Col. 3, lines 54-56 and states: "The posts are further located by diagonal guy wires 10,

which also serve to locate the centre posts P13 and P14." In other words, the guy wires simply maintain the location of the posts relative to each other. There is nothing to indicate that the guy wires 10 are intended to or impart any strength to a flexible membrane. Indeed, the only teaching in Warner concerning any portion of the structure imparting such strength to the membrane is with respect to the vertical tie-downs T1 and T2. At Col. 4, lines 5-7, the specification teaches that "The tie-down wires 5 serve to restrain the canopy in windy situations and prevent upward bowing or ballooning." Applicant believes that in reading the Cannon et al. reference, the Examiner erroneously believed the double crossing lines shown in Fig. 2 are crossing poles. In fact, although not specifically identified in Fig. 2, it is clear from the specification that these are "tendons" that are sewn into the edges of cloth panels that make up the canopy cover, and not poles.

CONCLUSION

Applicant respectfully submits that upon a correct reading of the cited references, neither reference alone or in combination discloses or suggests the unique combination of elements recited in the pending claims. Indeed, it is abundantly clear that neither reference even relates to structures of the type claimed, which are made of tensioned poles arranged in a crossing configuration. Thus, the cited references clearly do not support the §103 rejection of the pending claims.

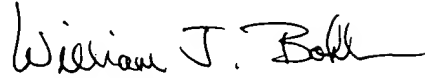
With the amendments to resolve the Examiner's §112 issues, applicant respectfully submits the pending claims recite patentable subject matter and are in proper form for allowance. Applicant therefore requests an early notice to that effect.

If the Examiner believes a further telephone discussion would expedite conclusion of the prosecution, the Examiner is invited to contact the undersigned attorney for applicant at the Examiner's convenience. In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is urged.

Appl. No. 09/919,748
Amdt. dated May 28, 2003
Amendment under 37 CFR 1.116 Expedited
Procedure Examining Group

PATENT

Respectfully submitted,



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Reg. No. 31,487

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/919,748	07/31/2001	Robert E. Gillis	016494-001100US	5719

20350 7590 06/06/2003

TOWNSEND AND TOWNSEND AND CREW, LLP
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SAN FRANCISCO, CA 94111-3834

EXAMINER

YIP, WINNIE S

ART UNIT PAPER NUMBER

3637

DATE MAILED: 06/06/2003

Notice Of Appeal Due 4/29/03 53P
Final: 7/29/03

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action

Application No.

09/919,748

Applicant(s)

GILLIS, ROBERT E.

Examiner

Winnie Yip

Art Unit

3637

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

- a) ☒ The period for reply expires 4 months from the mailing date of the final rejection.
- b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection. ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.
2. ☐ The proposed amendment(s) will not be entered because:
- (a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);
 - (b) ☐ they raise the issue of new matter (see Note below);
 - (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
 - (d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: _____

3. ☐ Applicant's reply has overcome the following rejection(s): _____.
4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
5. ☐ The a) ☐ affidavit, b) ☐ exhibit, or c) ☐ request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.
7. ☒ For purposes of Appeal, the proposed amendment(s) a) ☐ will not be entered or b) ☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

The status of the claim(s) is (or will be) as follows:

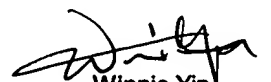
Claim(s) allowed: _____.

Claim(s) objected to: _____.

Claim(s) rejected: 1-20.

Claim(s) withdrawn from consideration: _____.

8. ☐ The proposed drawing correction filed on _____ is a) ☐ approved or b) ☐ disapproved by the Examiner.
9. ☐ Note the attached Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____.
10. ☐ Other: _____


Winnie Yip
Patent Examiner
Art Unit 3637

[54] ENCLOSURE

[76] Inventors: Gerhardt Allan Warner; Kurt Ehrich
Warner, both of 97 Canora Street,
Winnipeg, Manitoba, Canada

[21] Appl. No.: 797,520

[22] Filed: May 16, 1977

[30] Foreign Application Priority Data

Oct. 5, 1976 [GB] United Kingdom 41287/76

[51] Int. Cl.² A45F 1/16

[52] U.S. Cl. 135/4 R; D25/19;
D25/31; 52/66; 135/15 PE; 135/DIG. 1

[58] Field of Search 135/DIG. 1, 1 R, 3 R,
135/4 R, DIG. 8, 15 PE; 52/63, 64, 66, 67;
D25/13, 18, 19, 31

[56] References Cited

U.S. PATENT DOCUMENTS

2,716,993 9/1955 Codrick 135/4 R
2,856,942 10/1958 Scott 135/4 R

3,848,615 11/1974 Warner et al. 135/4 R

FOREIGN PATENT DOCUMENTS

1,281,038 11/1961 France 52/80
1,325,748 3/1963 France 135/4 R

Primary Examiner—Werner H. Schroeder

Assistant Examiner—Conrad L. Berman

Attorney, Agent, or Firm—Stanley G. Ade

[57] ABSTRACT

A shelter comprises at least two sets of arched support ribs with the support ribs of each set being pivoted by the adjacent ends thereof upon a common locus and having one set of support ribs over spanning the other set at an angle to each other. Some of the intersections are secured together and a flexible cover is secured over the support ribs. By situating the end support ribs in a plane at an angle to the supporting surface upon which the shelter is erected, substantially triangular openings are defined which can be used for access if required.

9 Claims, 9 Drawing Figures

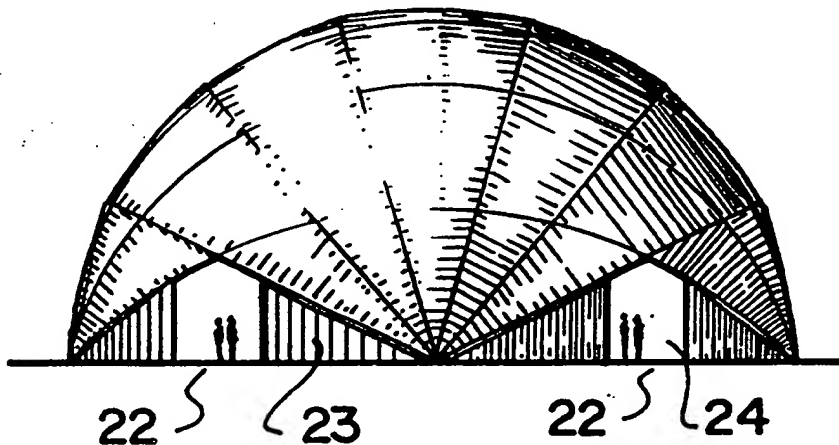


FIG. 1

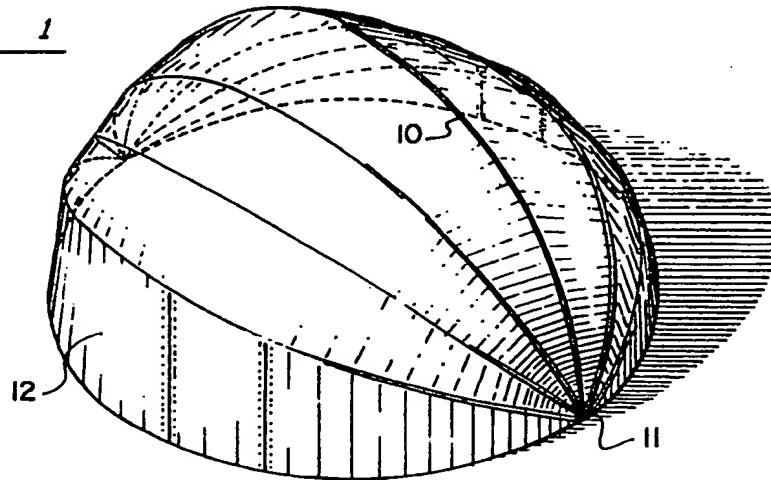


FIG. 3

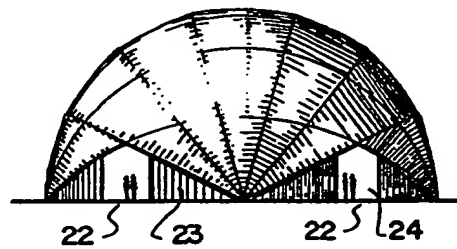


FIG. 2

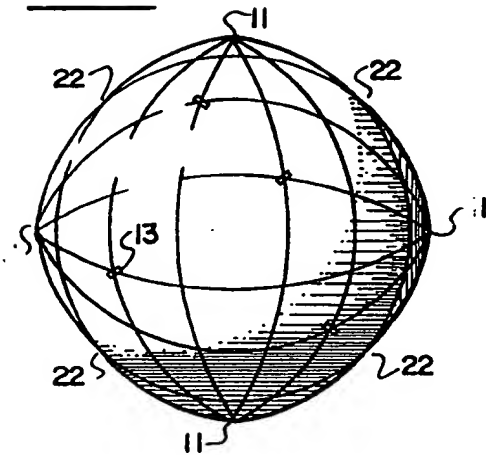


FIG. 3A

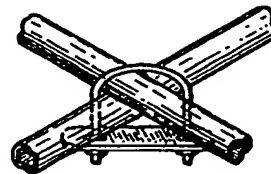


FIG. 4

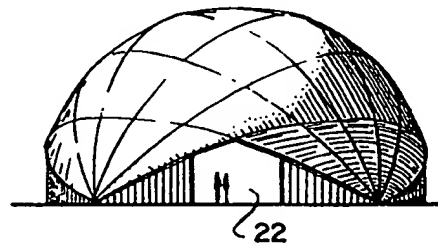


FIG. 5

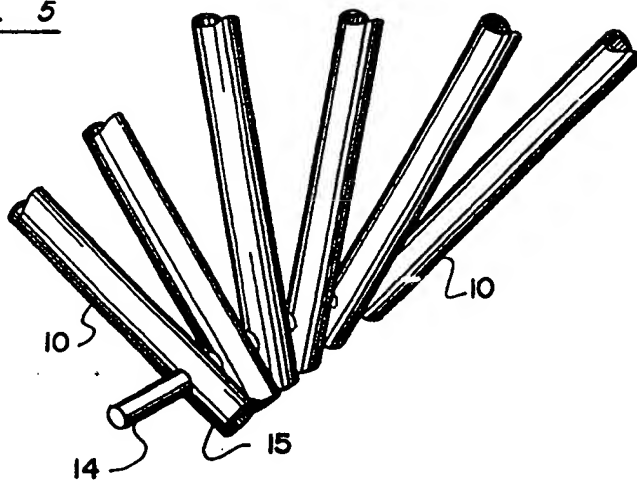


FIG. 6

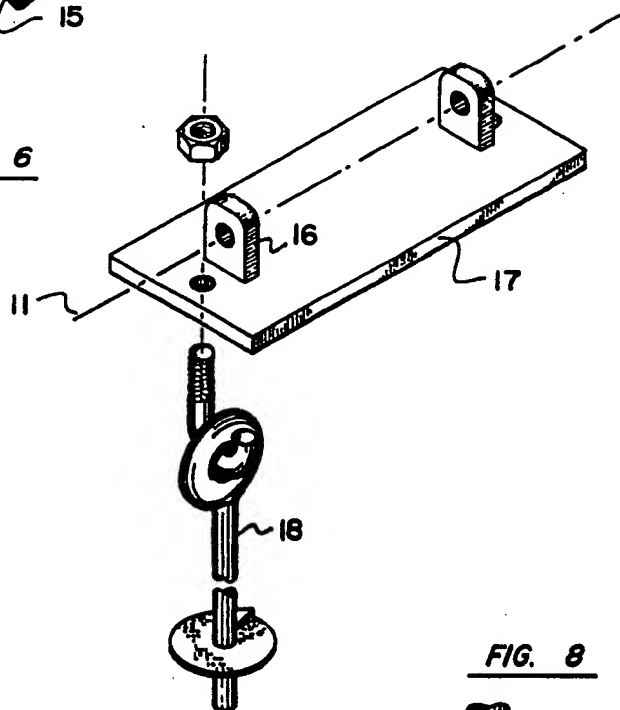


FIG. 7

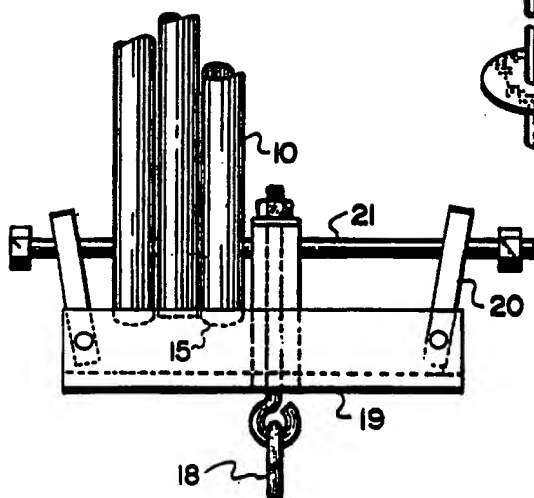
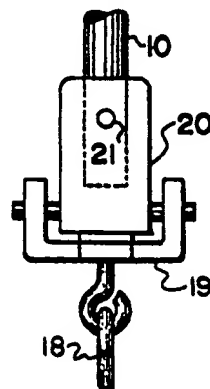


FIG. 8



ENCLOSURE

BACKGROUND OF THE INVENTION

This invention relates to new and useful improvements in portable and transportable shelters, particularly substantially circular shelters when viewed in plan or hemispherical shelters when viewed in side elevation.

Although relatively small shelters are well known which consist of coils of spring steel covered with a flexible fabric cover, nevertheless these are not always suitable for use in various environments.

Furthermore they are somewhat limited in size and application.

SUMMARY OF THE INVENTION

The present invention overcomes these disadvantages firstly by providing a shelter which can be of any desired size and which furthermore can be strengthened as desired by erecting two or more sets of frames at an angle to one another and securing the frames together where they intersect thus providing an extremely strong dome like shelter not requiring any external supports and having a clear span therewithin without the necessity of vertical or diagonal supports or pillars.

The principle object and essence of the invention is therefore to provide a device of the character herewithin described in which the frame comprises a plurality of substantially semi circular arched support ribs pivoted together on a common locus and having two or more sets of support ribs situated at an angle to one another with connections being made at the intersections of the support ribs. A flexible cover may be secured over the outer most set of support ribs or, alternatively, a flexible cover may be provided on both sets of support ribs depending upon design parameters.

Another object of the invention is therefore to provide a device of the character herewithin described in which, if two sets of support ribs are erected at right angles to one another, access openings are provided at approximately 45° to one another which may or may not be enclosed depending upon the use to which the shelter is being placed.

Another object of the invention is to provide a device of the character herewithin described in which all stresses are automatically transferred to pivot anchors to which the bases of all the support ribs are secured.

Another object of the invention is to provide a device of the character herewithin described which is simple in construction, economical in manufacture and otherwise well suited to the purpose for which it is designed.

Another object of the invention is to provide a device of the character herewithin described which is extremely resistant to wind and snow loading due to the hoops following a predetermined curve and the two or more sets of support ribs being joined at their intersections forming a multitude of spherical triangles which, by their inherent nature, are extremely strong.

With the foregoing objects in view, and other such objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawing in which:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of one set of support ribs shown in the erected position.

FIG. 2 is a top plan view of two sets of support ribs situated at right angles to one another.

FIG. 3 is a side view of FIG. 2.

FIG. 3A is a fragmentary isometric view of one of the methods of connecting the support ribs at their intersections.

FIG. 4 is an 45° elevation view of FIG. 2 showing one of the entrance and exit triangles.

FIG. 5 is a fragmentary isometric view of one end of a set of support ribs pivoted on a common locus.

FIG. 6 is an isometric partially exploded view of one typical anchoring and pivoting means.

FIG. 7 is a side elevation of an alternate pivoting and anchoring means.

FIG. 8 is an end view of FIG. 7.

In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

Proceeding therefore to describe the invention in detail, at least two sets of arched support ribs are provided and each set of hoops comprises a plurality of semi circular or curved ribs 10 pivoted on a common locus by the ends thereof as indicated by reference character 11 so that they can be collapsed one upon the other for transportation and storage or can be erected to form a dome shaped or substantially hemispherical frame as illustrated in FIG. 1. The support ribs may be formed from solid or tubular stock as desired.

A cover shown schematically in FIG. 1 and indicated by reference character 12, is made of flexible fabric or the like and may be secured to the individual support ribs or frames so that it opens and closes therewith. This securement may be by ties or pockets or sleeves secured to the inner surface of the support ribs at convenient locations (not illustrated).

It is preferable that at least two sets of support ribs are utilized in the erection of the structure, one set of support ribs being erected first and then a second set at an angle thereto and having a radius just slightly larger than the first set. Preferably the two sets of support ribs should be situated at right angles to one another.

This provides an intersecting structure shown in plan view in FIG. 2 and the intersections of the support ribs of each set are clamped together by means such as a U bolt assembly illustrated by reference character 13 in FIG. 2.

The ends of the support ribs of each set of ribs are pivoted on a common locus 11 as hereinbefore described and various methods may be provided to form this anchoring and pivot assembly.

FIG. 5 shows a pivot bolt 14 engaging through the apertured ends 15 of adjacent support ribs 10 and this bolt may engage a pair of spaced apart lugs 16 extending upwardly from a pivot plate 17 which in turn may be screw anchored to the ground or supporting surface as illustrated by reference character 18 in FIG. 6.

Alternatively, as shown in FIGS. 7 and 8, channel 19 may be provided with pivoted end plates 20 and a cross bolt 21 engaging through the end plates with the apertured ends 15 of the support ribs 10 engaging over the cross bolts 21. The pivoted plates 20 are provided so that the cross bolt and ends 15 can be assembled within the channel when desired.

When two sets of support ribs are erected as illustrated in FIGS. 2 and 3, a single cover can be secured to the outer set or, alternatively, covers can be attached to both sets depending upon design.

It will be noted that the outer support ribs of each set may be spaced above the ground or supporting surface as shown in FIG. 3 so that the configuration of two sets situated at right angles to one another, gives four substantially triangular entrance areas 22 which either may be left open, or may be closed by panelling 23 with doorways 24 left therein and FIG. 4 shows the configuration of such openings.

If a further set of support ribs frames is utilized, then the angles between the three or four sets are adjusted to make them equal thus giving additional strength to the structure once again depending upon its size and the design thereof.

Alternatively access openings may be provided on one side only with the support ribs of one set on the other side extending to the ground or supporting surface. The outer support ribs defining the openings are located in a plane at an angle to the horizontal, the angle being determined by the design height of the openings. These outer support ribs are held in position by clamping same at the intersections thereof to the adjacent support ribs of the other set.

It should be stressed that each set of support ribs is provided with two opposed anchoring and pivoting assemblies thus anchoring the structure firmly to the ground or supporting surface and that the pivot assemblies of each set have different pivot axes.

Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What we claim as our invention:

1. An enclosure structure for erection upon a supporting surface and comprising in combination at least two sets of arched support ribs and a flexible cover for said support ribs, means for each set of support ribs pivoting the adjacent ends of each set of support ribs on common loci, each set of support ribs being situated in angular relationship to one another whereby said means pivot-

ing the adjacent ends of each set of support ribs have different pivot axes, and means clamping some of said support ribs of one set of support ribs to some of said support ribs of the other set of support ribs at the intersections thereof.

2. The structure according to claim 1 in which said means pivoting the adjacent ends of each set of support ribs on a common locus includes a pivot pin mounting the said adjacent ends of said support ribs, a support member, a pair of lugs extending upwardly from said support member, engageable by said pivot pin for supporting same and anchor means for detachably securing said support member to the supporting surface.

3. The structure according to claim 2 in which said lugs are pivoted to said support member to facilitate mounting and dismounting said adjacent ends thereon.

4. The structure according to claim 1 in which each set of support ribs includes outer support ribs and at least one intermediate support rib therebetween.

5. The structure according to claim 4 in which said means pivoting the adjacent ends of each set of support ribs on a common locus includes a pivot pin mounting the said adjacent ends of said support ribs, a support member, a pair of lugs extending upwardly from said support member, engageable by said pivot pin for supporting same and anchor means for detachably securing said support member to the supporting surface.

6. The structure according to claim 5 in which said lugs are pivoted to said support member to facilitate mounting and dismounting said adjacent ends thereon.

7. The structure according to claim 4 in which at least one outer support rib of each set is situated in a plane at an angle to the horizontal when erected, thus defining at least two access openings in said structure.

8. The structure according to claim 7 in which said means pivoting the adjacent ends of each set of support ribs on a common locus includes a pivot pin mounting the said adjacent ends of said support ribs, a support member, a pair of lugs extending upwardly from said support member, engageable by said pivot pin for supporting same and anchor means for detachably securing said support member to the supporting surface.

9. The structure according to claim 5 in which said lugs are pivoted to said support member to facilitate mounting and dismounting said adjacent ends thereon.

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United States Patent [19]

Cannon et al.

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[54] CANOPY

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E04B 1/12; A47H 23/00

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135/DIG. 5; 52/63; 52/222; 160/328

[58] Field of Search 135/115, 117, 119, 905,
135/DIG. 8, 97, 99, DIG. 9, DIG. 5; 47/20, 28,
47; 52/63, 222; 160/327, 328, 329

[56] References Cited

U.S. PATENT DOCUMENTS

595,149 12/1897 Coulson 47/20
1,622,435 2/1924 Frazee .
2,051,643 8/1936 Morrison 135/119 X
2,355,008 8/1944 Moran 135/DIG. 8
2,403,661 7/1946 Hurley 160/328
2,497,596 2/1950 Frieder et al. 135/115 X
2,604,897 7/1952 Cottor et al. 135/115 X
2,979,129 3/1958 Ketchum .
3,465,764 7/1967 Huddle .
3,820,840 6/1974 Forsberg .
3,874,396 4/1975 Kirkham .
3,960,161 6/1976 Norman 135/905 X

4,068,404 1/1978 Sheldon 47/28 R X
4,162,100 7/1979 Muscillo .
4,210,191 7/1980 Li 160/354
4,229,914 10/1980 Lucas .
4,574,538 3/1986 Grant 52/222 X

FOREIGN PATENT DOCUMENTS

3297 of 1926 Australia .
1234363 2/1967 Fed. Rep. of Germany 135/119
2339320 8/1973 Fed. Rep. of Germany 135/97
2430531 7/1978 France .
387919 5/1965 Switzerland .
277443 9/1927 United Kingdom .
637114 5/1947 United Kingdom .
727178 12/1953 United Kingdom .
918136 2/1963 United Kingdom 135/99
729324 4/1980 U.S.S.R. 52/222

OTHER PUBLICATIONS

"The Country Life Book of Nautical Terms under
Sail", Published 1978, by the Hamlyn Publishing Group
Ltd., London.

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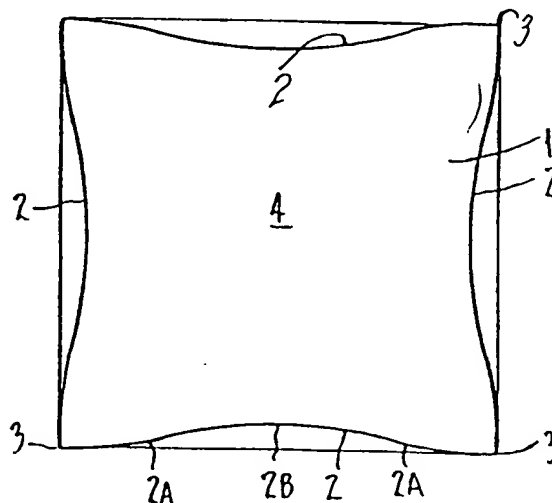
Assistant Examiner—D. Neal Muir

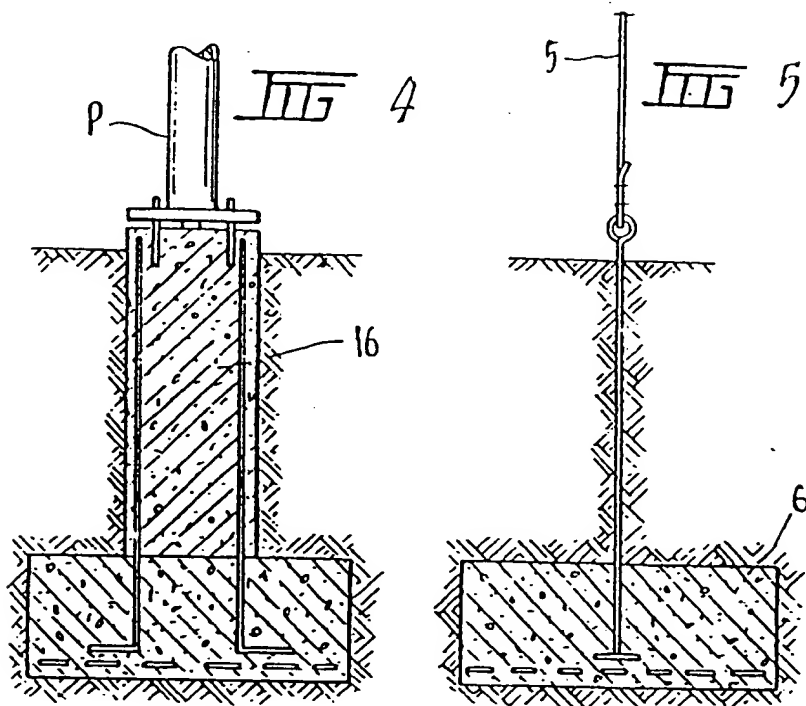
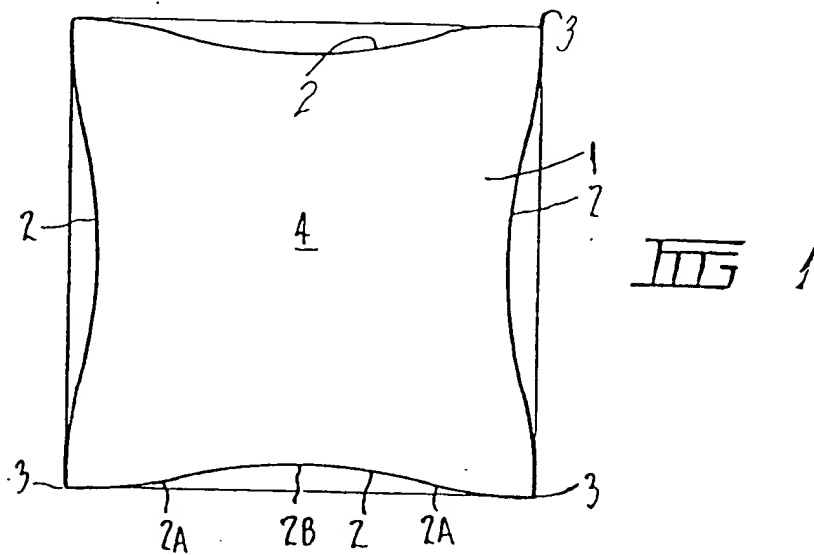
Attorney, Agent, or Firm—Robert J. Koch

[57] ABSTRACT

This canopy system is supported by alternate poles and features edge cords to stress the center of the canopy fabric to reduce sag. The cords are attached adjacent each edge of each canopy segment and resembles a bell curve with respect to that edge. Longitudinal stresses placed on each cord urge the cord to straighten. As the cords straighten, they tension the center of the fabric without undue strain on the edge fabric. The result is a large area canopy with few interior poles and few peak elevations to the affected by wind forces.

13 Claims, 5 Drawing Figures





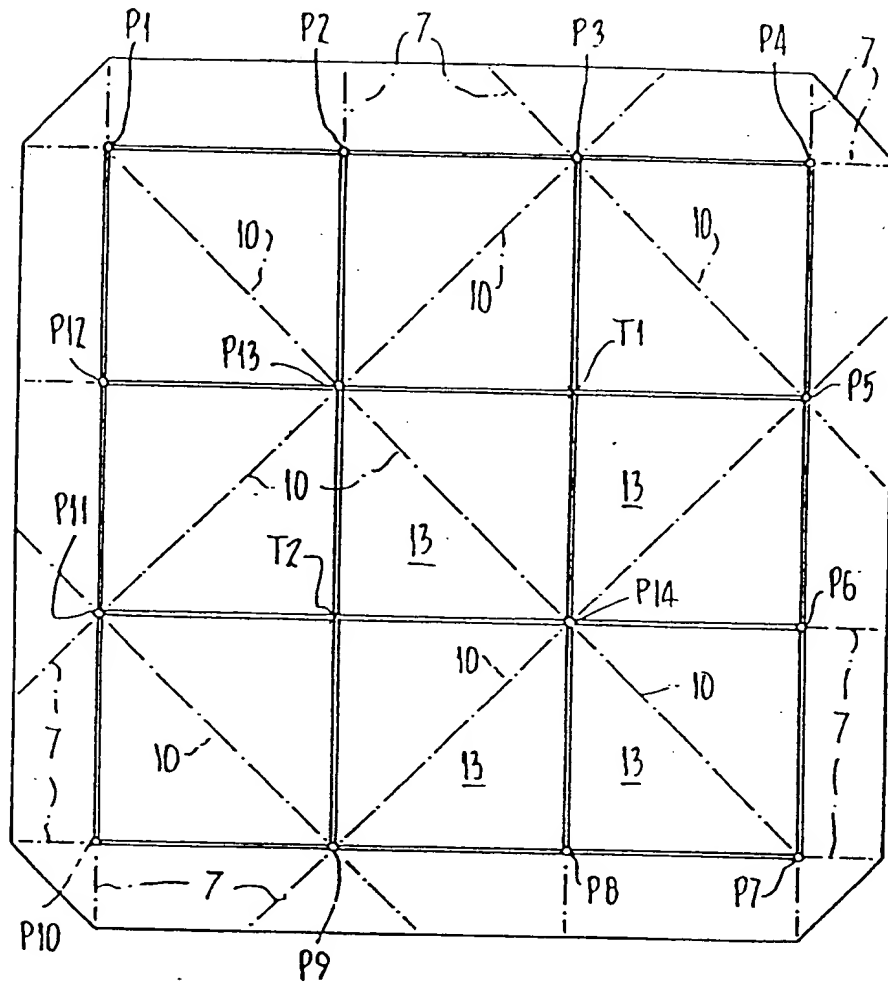


FIG. 2.

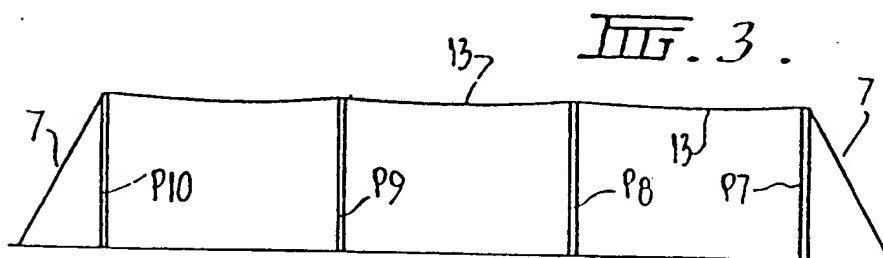


FIG. 3.

CANOPY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a canopy and has been devised particularly though not solely as a shade canopy.

2. Description of the Related Art

It is necessary in many applications to provide an overhead canopy for shelter or shade and particularly in agricultural situations to provide shade for plants. Many other applications also require the provision of overhead canopies to protect or shade articles which are placed outside to prevent degradation from ultraviolet light. In the past shade canopies have been provided using various types of structures to support either opaque awnings or shade cloths using a rigid frame structure or a large number of upright poles or posts to support the cloth. It is a disadvantage of such systems that the poles or posts must be closely spaced in order to prevent excessive sagging of the canopy fabric which is difficult from the point of view of cultivation or the placing of large objects beneath the canopy.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a canopy which will obviate or minimize the foregoing disadvantages in a simple yet effective manner or which will at least provide the public with a useful choice.

Accordingly in one aspect the invention consists in a method of erecting a canopy comprising the steps of erecting a plurality of posts in a predetermined array, providing a plurality of panels of canopy fabric of stretch material having inelastic or low stretch tendons fastened thereto at or adjacent the panel edges, fastening diagonally opposite corners of each said panel to selected ones of said posts and drawing together the remaining corners of adjacent panels so as to tension said tendons and hence tension said stretch fabric.

Preferably said tendons are fastened to said fabric continuously along the length of each tendon.

Preferably said panel edges are substantially straight and the tendons are fastened thereto in a curve having each end thereof at adjacent corners of the panel and extending inwardly into the panel at the mid-portion of the panel edge.

Preferably said curve is a bell shaped curve being convex with respect to the panel edge adjacent the corners of the panel and concave with respect to the panel edge adjacent the mid portion of the panel edge.

Preferably said panels are rectangular and said posts are arranged in a rectangular array.

Preferably five said posts are provided in said rectangular array, therebeing one said post at each corner and one post in the middle, and wherein four said panels are provided, each panel being fastened first to the centre post and one corner post and then having the other two diagonally opposite corners drawn together with the adjacent corners of the adjacent panels at the mid-points of the sides of the rectangular array.

Preferably said fabric comprises a stretch knit fabric and said tendons comprise rope or webbing.

Preferably said fabric comprises knitted shade cloth and said tendons comprise webbing of the type commonly used for automotive seat belts.

Preferably said webbing is sewn to said fabric along the entire length of the webbing.

In a further aspect the invention consists in a canopy comprising an array of posts and a plurality of panels stretched therebetween at the desired height, each said panel being formed from stretch fabric material having inelastic or low stretch tendons fastened thereto at or adjacent the panel edges in a curve extending inwardly between the panel corners so that when the tendons are tensioned between the posts the curved tendons at least partially straighten drawing fabric from the middle area of the panel and tensioning the panel.

Preferably said curve is a bell shaped curve being convex with respect to the panel edge adjacent the corners of the panel and concave with respect to the panel edge adjacent the mid-portion of the panel edge.

Preferably said fabric comprises a stretch knit fabric and said tendons comprise rope or webbing.

Preferably said fabric comprises knitted shade cloth and said tendons comprise webbing of the type commonly used for automotive seat belts.

Preferably said webbing is sewn to said fabric along the entire length of the webbing.

In a still further aspect the invention consists in a rectangular canopy panel of stretch fabric having inelastic or low stretch tendons fastened thereto at or adjacent the panel edges in a curve extending inwardly between the panel corners.

Preferably said curve is a bell shaped curve being convex with respect to the panel edge adjacent the corners of the panel and concave with respect to the panel edge adjacent the mid-portion of the panel edge.

Preferably said fabric comprises a stretch knit fabric and said tendons comprise rope or webbing.

Preferably said fabric comprises knitted shade cloth and said tendons comprise webbing of the type commonly used for automotive seat belts.

Preferably said webbing is sewn to said fabric along the entire length of the webbing.

BRIEF DESCRIPTION OF THE DRAWINGS

Notwithstanding any other forms that may fall within its scope one preferred form of the invention will now be described by way of example only with reference to the accompanying drawings in which:

FIG. 1 is a plan view of a fabric panel used in a canopy according to the invention,

FIG. 2 is a plan view of a canopy according to the invention,

FIG. 3 is a side elevation of the canopy shown in FIG. 2,

FIG. 4 is a cross-sectional elevation to an enlarged scale of the footing for a post used in the canopy according to the invention, and

FIG. 5 is a cross-sectional elevation to an enlarged scale of the footing for a tie-down used in the canopy according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the preferred form of the invention a canopy particularly used as a shade canopy and using a fabric shade cloth is constructed as follows although it will be appreciated that the invention may be utilized in any situation where it is desired to provide an overhead canopy.

The canopy is formed from a plurality of panels such as that shown at 1 in FIG. 1 which may be formed from any desired stretch material and which in the preferred form of the invention are formed from knitted polyethylene shade cloth. A typical cloth is that made by Gale

Pty. Ltd. of Australia as Elderado Weathershade. The panel may be of any desired size and may be formed from a single length of knitted cloth or from a number of lengths of cloth sewn together to form a large rectangular array. In the example of the invention shown in the accompanying drawings each panel may for example be approximately 50 feet (14.33 m) along each side. Each panel is provided with inelastic tendons fastened to the panel at or adjacent the panel edges. The inelastic characteristic of the tendons refers to a tendon exhibiting little or no stretching qualities. In the preferred form of the invention the tendons are formed from webbing 2 sewn to the panel fabric adjacent each edge. The tendons are formed from a type of webbing commonly used for automotive seat belts although it will be appreciated that other forms of webbing, rope or cable may be used in this application. The webbing is sewn continuously to the panel fabric in a curve extending inwardly between the panel corners 3 so that when the webbing is tensioned (as will be described below) the curve at least partially straightens drawing the fabric from the middle area 4 of the panel.

Although the curve may be a simple curve which is concave when viewed from the panel edge it has been found that a curve of this type over tensions the fabric in the areas adjacent the corners 3. It is therefore preferred to sew the webbing to the fabric in a bell shaped curve being convex with respect to the panel edge over the areas 2A adjacent the corners of the panel and concave with respect to the panel edge over the area 2B adjacent the mid-portion of the panel edge. The depth of the curve may be varied to suit the fabric used and the panel size but it has been found suitable with knitted polyethylene shade cloth in panels 14.3 m along each side to use a curve depth of 500 mm between the panel edge and the webbing at the mid-point of the side.

In one form of the invention the canopy may be erected using fourteen posts comprising twelve edge posts P1-P12 and two centre posts P13 and P14 as shown in FIG. 2. The canopy may however be formed to any required size or configuration using a basic rectangular array of four panels 13 based on four corner posts P13, P5, P9 and P7 and a centre post P14. It will be appreciated that the basic rectangular array may be repeated any number of times to build up a shade canopy to cover the desired area.

Each edge post is supported by guy wires 7 which are anchored into the ground by any convenient anchor such as a block of concrete buried in the ground. The posts may similarly be supported on any suitable footing such as that shown in FIG. 4. It is desirable that the posts can rock on the footing 16 to give an elastic structure which can move to absorb wind loadings or other abnormal loadings in use. The posts are further located by diagonal guy wires 10 which also serve to locate the centre posts P13 and P14.

Once the rectangular array of posts has been erected, fabric panels such as that shown in FIG. 1 are positioned within the array and opposite diagonal corners of the panels are secured to the posts at the desired height which is normally at the top of the posts. In this manner the diagonally opposite corners of the panels are fastened to their adjacent posts P1, P3, P13, P5, P11, P14, P9 and P7. The remaining diagonally opposite corners of the panels are then drawn together with the adjacent corners of the adjacent panels at points P2, P4, P12, T1, T2, P6, P10 and P8. Where these points coincide with a post, i.e., around the perimeter of the canopy, they may

then be fastened to that post. At the intermediate points T1 and T2 it is not necessary to provide a post but desirable to provide tie-down wires 5 (FIG. 5) from the tension point to an anchor block 6 buried in the ground. The tie-down wires 5 serve to restrain the canopy in windy situations and prevent upward bowing or ballooning.

The drawing together and tensioning operation may be performed by any suitable tensioning apparatus. As the corners are drawn together to corner points the webbing tendons 2 are tensioned causing the curve of the webbing to straighten and tension the fabric across the entire area of the panels.

Once the panels have been drawn together and tensioned the edges of adjacent panels (outside the tendons) may be fastened together to form a continuous cover. The fastening may be by way of clips or lacing but preferably by sewing using a small hand held portable sewing machine.

The basic rectangular array of four panels 13 erected as described may be repeated to cover any desired area. It has been found that by using four such basic rectangular arrays of four panels each, it is possible to cover an area of approximately one acre. The area so covered has the advantage that there are only five internal posts within the acre area leaving large free areas for cultivation or storage. The canopy formed according to the invention is very resilient and capable of withstanding high wind loadings and furthermore because it is an elastic tensioned structure the canopy is able to resist impact from various objects such as falling branches without significant damage to the canopy.

In this manner a canopy can be provided which is simple and easy to erect and which can cover large areas of land in a simple and cheap manner with the use of a minimum number of support posts.

Although the canopy has been described in a certain size and using a certain material it will be appreciated that the basic canopy system may be applied in many different applications requiring different canopy sizes and using different fabric to suit the intended application.

We claim:

1. A canopy comprising an array of posts and a plurality of panels stretched therebetween at a desired height;

each of said panels comprising;

a stretch fabric panel member; and a means for tensioning said panel extending inwardly along edges of said panel member between adjacent corners in a bell shaped configuration, which is concave in a center portion and convex in areas adjoining said corners, relative to said edge, wherein

said means for tensioning is an inelastic tendon fastened to said panel member; and

wherein each of said tendons is tensioned between said posts so that the configuration is at least partially straightened thereby drawing the fabric from a middle area of the panel and tensioning said panel.

2. A canopy panel as claimed in claim 1, wherein said fabric comprises a stretch knit fabric and said tendon is webbing.

3. A canopy panel as claimed in claim 2 wherein said fabric comprises knitted shade cloth and said tendons comprise webbing of the type commonly used for automobile seat belts.

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4. A canopy panel as claimed in claim 3 wherein said tendons comprise webbing which is sewn to said fabric along the entire length of the webbing.

5. A canopy as claimed in claim 1 wherein said fabric comprises a stretch knit fabric and said tendons comprise webbing.

6. A canopy panel as claimed in claim 1, wherein said fabric comprises knitted shade cloth and said tendons comprise webbing of the type commonly used for automobile seat belts.

7. A canopy according to claim 1, wherein said panels are rectangular and said posts are arranged in a rectangular array.

8. A canopy according to claim 7, wherein said array comprises four rectangularly arranged posts and one post arranged centrally to said four posts; and further comprising four panels each arranged with a first corner attached to said one post and a second diagonally opposed corner attached to a respective one of said four

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posts and wherein each remaining corner is attached to a remaining corresponding corner of an adjacent panel.

9. A canopy according to claim 8, further comprising means for attaching adjacent edges of said panels.

10. A canopy according to claim 9, further comprising means for tying down attached remaining corners.

11. A canopy panel comprising:

a stretch fabric panel member; and

means for tensioning said panel extending inwardly along edges of said panel member between adjacent corners in a bell shaped configuration which is concave in a center portion and convex in areas adjoining said corners, relative to said edge, wherein said means for tensioning is an inelastic tendon fastened to said panel member.

12. A canopy panel according to claim 3, wherein said tendons are fastened to said fabric along an entire length of said tendon.

13. A canopy panel according to claim 11, wherein said edges are substantially straight.

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